

Claims: -

1. A needle for the delivery of a liquid to a subject, comprising a shaft having an internal surface defining a longitudinally extending internal bore open at one end thereof to receive a liquid  
5 supply, the other end of the shaft being sharpened for penetration of the skin of the subject, the shaft being provided with at least one aperture in the form of a cut extending across the external surface of the side of the shaft at a sufficient depth to establish communication with the bore, wherein the external aperture area is greater than the  
10 internal aperture area, said areas being defined by the surface areas of the material removed between the external and internal surfaces of the shaft, respectively.
2. A needle according to Claim 1, wherein the sharpened end of the needle is in the form of a bevelled or conical tip and the aperture  
15 is formed by a linear cut made at an angle to the internal bore which is greater than or equal to the angle between the bevelled or conical surface and the longitudinal bore.
3. A needle according to Claim 1 or 2, wherein the cut  
20 extends in a direction approximately perpendicular to the longitudinal bore.
4. A needle according to any preceding claim, wherein the width of the cut on the external surface of the shaft is greater than the width of the cut on the internal surface of the shaft.
5. A needle according to Claim 4, wherein the width of the  
25 cut on the external surface of the shaft is at least twice the width of the cut on the internal surface of the shaft.
6. A needle according to any preceding claim, wherein the shaft has a C-shaped cross section at the locus of the aperture, defined by the partial circumferences of the internal and external shaft surfaces  
30 and by the aperture surfaces formed by the cut which connect the

internal and external shaft surfaces, said aperture surfaces being coplanar.

5        7.     A needle according to any preceding claim, wherein the shaft is provided with a plurality of said apertures, each of which is located a different distance from the sharpened end of the needle.

8.     A needle according to any preceding claim, wherein the ratio between the external aperture area and the internal aperture area is greater than or equal to the ratio between the external width of the shaft and the internal width of the bore.

10      9.     A needle according to any one of preceding claim, wherein the depth of the cut relative to the external surface varies along the length of the cut.

15      10.    A needle according to Claim 9, wherein the depth of the cut increases from zero at either end of the cut to a maximum depth towards the centre of the cut which is greater than or equal to the thickness of the wall of the shaft at that point.

11.    A needle according to Claim 9, wherein the variation in the depth of the cut results from a planar cut surface machined across a curved external surface.

20      12.    A needle according to any preceding claim, wherein the sharpened end is provided with a terminal orifice to assist in delivery of the liquid through the needle.

25      13.    A needle according to any preceding claim, wherein the or each aperture is formed by the operation of a grinder on the surface of the shaft.

14.    A needle according to any preceding claim, wherein the or each aperture is formed by milling.

15. A needle according to any preceding claim, wherein the external and internal surfaces of the needle are defined generally in cross-section by two concentric circles.

5 16. A method of manufacturing a plurality of delivery needles, comprising the steps of arranging a plurality of tubular shafts having internal bores in a row in parallel with one another and performing a machining operation across the row of shafts to create at least one aperture in the external surface of the side of each shaft at a sufficient depth to establish communication with the bore of each shaft.

10 17. A method according to Claim 16, wherein the machining operation includes running a grinder across the row of shafts to grind a line of grooves across the surfaces of the shafts, the grooves being sufficiently deep to provide communication between the external surfaces of the shafts and the internal bores of the shafts.

15 18. A method according to Claim 17, wherein the process also comprises the step of sharpening the shafts while they are arranged in a row.

20 19. A liquid delivery device for delivering a liquid to a subject, comprising a reservoir for the liquid, means for driving the liquid from the reservoir to an outlet, and a delivery needle according to any one of Claims 1-15 in communication with the outlet.

25 20. A device according to Claim 19, wherein the reservoir and driving means are located in a housing which is provided with means for attachment to the skin of the subject and wherein the delivery needle protrudes from the housing in use such that it penetrates the skin of the subject upon application of the device to allow delivery of the liquid through said needle.

30 21. A device according to Claim 19 or 20, wherein the delivery rate of the device is calibrated according to the pressure exerted by the driving means.

22. A needle for the delivery of a liquid to a subject, substantially as hereinbefore described with reference to and as illustrated in Figs. 1-3, 4-8, 9-10 and 11-12 of the accompanying Drawings.

5           23. A method of manufacturing a plurality of delivery needles, substantially as hereinbefore described with reference to and as illustrated in Figs. 9-10 and 11-12 of the accompanying Drawings.

10           24. A liquid delivery device, substantially as hereinbefore described with reference to and as illustrated in Fig. 13 of the accompanying Drawings.

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